

## NETL'S CLIMATE CHANGE ACTIVITIES: DEVELOPING MARKET-BASED PROCEDURES FOR GHG MITIGATION ACTIVITIES

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Over the last decade, the international community has engaged in a series of negotiations aimed at reducing greenhouse gas (GHG) emissions and combating the potential negative effects of climate change. A number of treaties, agreements, and voluntary programs have been proposed to address this issue. The context and reach of these domestic and international activities vary significantly, however, most of them display one major characteristic. Whereas past activities to control harmful emissions have been centered on command-and-control regulations, these new proposals to limit GHG emissions are based on flexible, market-based procedures that facilitate the use of low-cost solutions. These include provisions for emissions trading and the introduction of a new concept whereby investors and polluters can obtain credit for GHG reduction activities undertaken outside U.S. borders. Although the procedures and framework for responding to the issue of global climate change are still evolving, it is likely that any future domestic or international GHG reduction efforts will rely heavily on such market-based procedures.



However, the successful implementation and use of project-based market mechanisms will require the development of transparent, cost-effective, and environmentally sound protocols for quantifying the emission reductions associated with different types of projects. Investors will need to be assured of the credibility of the estimated emission reductions before investing in either projects or the tradable credits these projects would yield. Moreover, credible and verifiable data will be required for quantifying the emission benefits of project-specific GHG reduction activities.



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## **NETL Research: Developing Protocols for Evaluating, Quantifying and Verifying GHG Emission Reductions – A Case Study Approach**

The National Energy Technology Laboratory (NETL) has been at the forefront of examining the many issues surrounding the transfer of clean technologies and the implementation of market-based mechanisms for controlling GHGs. NETL's recognized expertise in advanced energy technologies and project development beyond U.S. borders places it in a position to contribute significantly to the development of such protocols.

NETL has taken a unique approach by analyzing the efficacy of the proposed protocols through hypothetical case studies focusing on several developing countries and a number of advanced technologies. In a series of reports, NETL has examined a number of protocols for quantifying project-level GHG emission reductions. This research includes an analysis of the free rider concept as it applies to all of the various approaches. NETL is now researching the data requirements necessary to support project emissions baseline development, examining the availability of this data, and developing guidance for collecting and reporting on emissions data. Finally, NETL has offered an alternative approach to emissions baseline development called the modified technology matrix. This approach pre-qualifies a set of advanced technologies for use in GHG emission reduction projects based on a consideration of the technology's economics and market penetration. It is designed to substantially reduce the costs associated with project evaluation.



NETL's most recent effort on this topic compares the modified technology matrix with other major proposals using a series of hypothetical case studies. A total of 40 case studies were examined, including 11 in the electricity sector, 13 in the industrial sector, 9 in the transportation sector, 2 in the land use and forestry sector, 3 in the residential sector and 2 in the commercial sector. Table 1 presents a list of countries and sectors covered by the case studies, as well as examples of some of the technologies reviewed. Table 2 provides a partial list of some of the individual case studies included in the analysis.

Table 1. Sample Countries, Sectors and Technologies Analyzed

COUNTRIES	SECTORS	SAMPLE TECHNOLOGIES
Argentina	Electricity	Carbon Sequestration
Azerbaijan	Industrial	Coal-bed Methane Recovery
Brazil	Land Use & Forestry	Cogeneration
Chile	Residential	Compressed Natural Gas Vehicles
China	Commercial	Distributed Generation Fuel Cells
India	Transportation	District Heating
Jordan		Gas-to-Liquids (Clean Diesel)
Kazakhstan		Gas Turbines
Mexico		Hybrid-Electric Vehicles
Russian Federation		Hydropower
South Africa		Integrated Gasification Combined Cycle
Tajikistan		Natural Gas Combined Cycle
Thailand		Supercritical Coal
Ukraine		Wind Turbines

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Table 2. Sample Project Case Studies

## NETL Reports on GHG Protocol Development

- Developing Emission Baselines for Market-Based Mechanisms: A Case Study Approach
- Developing the Technology Matrix for India and Ukraine
- Case Study Analysis of the U.S. and EU Market Mechanism Proposals

To obtain a copy of these reports, please contact **Mr. James Ekmann** at NETL by phone **(412) 386-5716** or visit the NETL website at [www.netl.doe.gov/products/ccps/index.html](http://www.netl.doe.gov/products/ccps/index.html)

- Afforestation of Marginal Agricultural Land, Russia
- Aluminum Rail Cars for Efficient Coal Transport, China
- Carbon Sequestration Technology for an IGCC Plant, India
- Clean Diesel in Transit Buses, South Africa
- Dedicated Compressed Natural Gas Taxis, India
- Forest Protection and Management, Mexico
- Fuel Cells for Distributed Generation, India
- Heat Rate Improvement in India
- Highly Efficient Fertilizer Complex, Jordan
- Installation of Variable Frequency Drives in Argentina
- Natural Gas Combined Cycle Plant in India
- PFC Reductions at Aluminum Plant, Tajikistan
- Retrofit of Energy Efficient Motors, Brazil
- Sale of Energy-Efficient Light Bulbs for Homes, Mexico
- Smart Highway Toll System, Thailand
- Transmission Capacity Expansion in China

## Conclusion

NETL's case study approach raises several interesting points regarding emission baseline development. First, the case study analysis provides an indicator of how effectively the different project evaluation protocols succeed in screening out free rider projects. Second, the case studies help identify project types that are unsuitable for evaluation under standardized baseline development procedures. Finally, the case study approach helps identify particular data requirements for project evaluation and determine the availability of data to meet those requirements.